STUDIES IN WESTERN VIOLETS. VII.

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Viola purpurea Kell. and its subspecies as well as *V. pedunculata* Torr. & Gray and its subspecies, both members of the *Nuttallianae*, were treated in part six of this series (Madroño 10:110–128. 1949). The present paper completes the account of the *V. purpurea* complex by treating *V. aurea*, another member of the Section *Nuttallianae*, and also proposes new taxa and changes of status in other groups.

Viola aurea

Although closely allied to *V. purpurea*, *V. aurea* is treated herein as a separate species, partly because of its desert habitat and partly because it possesses some characters not found in *V. purpurea*. The flowers of *V. aurea* are somewhat larger, the lateral petals are scantily bearded, and the seeds are more slender than are the nearly spherical seeds of *V. purpurea* and they have a larger caruncle.

Viola aurea Kell. Proc. Calif. Acad. Sci. 2:185. 1862. Erect or decumbent desert plants from a shallow or deep-seated rootstock having a single taproot or a combination of taproot and adventitious roots; stems conspicuous or dwarf during anthesis but more conspicuous later; first leaves long-petioled, more or less rounded and the margins coarsely toothed; cauline leaves many on shorter petioles; herbage mostly grayish owing to pubescence or puberulence (certain races glabrate and therefore of greener aspect); length of peduncles varying from slightly to greatly exceeding the foliage, corolla yellow, purple-backed at least on the upper petals, 15–16 mm. in diameter, lateral petals scantily bearded, spur short, scarcely exserted from the bases of the sepals; sepals linear-lanceolate, pubescent or ciliate, foramen bounded on the lower side by a minute lip, head with many backward-pointing lateral beards; ovary and capsules puberulent; seeds with conspicuous caruncle covering nearly one-third of length of seed, seeds approximately twice as long as wide; chromosomes 12 pairs in two of the three subspecies.

Viola aurea subsp. **aurea**. *V. aurea* Kell. Proc. Calif. Acad. Sci. 2:185. 1862. Illustrations, see Madroño 10: pls. 5, 7, table, p. 117 (as *V. aurea typica*). 1949.

Plants 4–12 cm. tall, geophytic, with winter buds 2–6 cm. below the soil surface; root system of many stout primary and secondary roots supplemented by numerous adventitious roots; stems 1 to 5, one-third to one-half or more subterranean, total length 2–6 cm. above ground erect and crowded with leaves and flowers; plant canescent throughout; basal leaves 1–6, ovate to nearly round, cuneate to almost truncate at base, invariably decurrent on the petiole, conspicuously obtuse at apex, margin

coarsely repand-dentate, 1.4–3.4 cm. wide, 1.2–5 cm. long; cauline leaves more numerous, narrower and sharper at apex, base more often truncate, margins less deeply dentate, ovate to ovate-lanceolate 0.9–1.9 cm. wide and 1.5–3.7 cm. long on petioles 1.4–5.3 cm.; stipules of radical leaves scarious, adnate, forming linear-lanceolate, petiolar wings, the free portion 2–4 mm. long; cauline stipules scarcely foliaceous, ovate-lanceolate to oblong-lanceolate, entire, 5–12 mm. long; peduncles cauline, villous, those of petaliferous flowers mostly as high as or slightly exceeding the foliage, 3–10 cm. long; bracteoles scarious, narrowly linear, ca. 2 mm. long; sepals lanceolate, acute, more or less long-villous and regularly but minutely ciliolate, ca. 1.5 mm. wide and 4–5 mm. long; petals oblong-obovate, 5 mm. wide and 8 mm. long; lateral petals faintly marked by three dark lines, nearly beardless (4–10 beards), narrowly obovate; lower petal with seven distinct lines and two fainter ones, total length including spur 13 mm.; capsule nearly orbicular in outline, ca. 6 mm. in diameter, densely puberulent; seeds brown, average weight 2.15 mg.

Viola aurea was described and named by Dr. Kellogg in 1862 from plants brought to him from "Nevada Territory" by C. W. Dorr. No type specimen was preserved, but there is an illustration (Proc. Calif. Acad. Sci. Ser. 1. 2:187. 1862). There has never been any doubt, however, as to the plant Dr. Kellogg had in mind since, as he states, it is "almost woolly in external appearance."

Until recent years this subspecies was abundant about Verdi and Reno, Nevada, but the plants are fast being exterminated by the grazing and trampling of stock. It ranges from Pyramid Lake, Nevada, south on the east side of the Sierra Nevada to "Mojave Station," the San Bernardino Mountains and to the Cuyamaca Mountains in San Diego County, California, at altitudes from 4000 to 7000 feet. It is far from common; all of the collections in the large herbaria of the United States numbered only seventeen in 1936. Because of the woolly appearance and inconspicuous stems this subspecies is readily distinguished from subsp. *mohavensis* while its woolly pubescence also readily distinguishes it from subsp. *arizonensis*. It belongs in the *V. purpurea* complex because of the thickness and outline of its leaves, its elongated peduncles, its puberulent capsules, and the conspicuously darkened backs of the upper petals.

VIOLA AUREA subsp. **mohavensis** Baker and Clausen subsp. nov. Illustrations, see Madroño 10: pls. 5, 7, pp. 115, 121; table, p. 117, 1949.

A *V. aurea* subsp. *aurea* planta tota propter pilos brevissimos omnino canescente marginibus foliorum radicalium valde sinuatis eis caulinis dentibus incurvatis grosse serratis caulibus magis auctis floribus longipedunculatis discedit.

FIG. 1. *Viola aurea* subsp. *mohavensis* Baker and Clausen, photograph of type specimen.

Erect desert plants, 6–30 cm. high, mostly with gray foliage, covered throughout with a microscopic puberulence or some races glabrate and thus of greener aspect; rootstock erect, deep-seated or near the surface; root system with a long taproot or

several large secondary roots, with or without adventitious roots; stems 1 to 5, 3–10 cm. high during anthesis but occasionally up to 24 cm. in height in fruit; basal leaves several, large, teeth coarse and rounded (op. cit. pl. 5) truncate or slightly cuneate at base, 1–3.5 cm. wide, 1–4 cm. long, on petioles 3.5–11 cm. long; cauline leaves progressively smaller upwards and on shorter petioles, teeth sharper and shaped as in a bandsaw (op. cit. pl. 5); stipules of radical leaves adnate, nearly obsolete, the free wing barely visible, those of the cauline leaves foliaceous, often very unequal even at the same node, variable in shape, lanceolate to linear or oblong, mostly entire, 2.5–5 mm. long; peduncles axillary, extending well above the foliage, bracteoles somewhat scarious, often noticeably separated; flowers as in the *aurea* group, but the amount of bearding on lateral petals variable from about 10 beards to many; seeds light brown, average weight 2.3 mg.

This subspecies is the most "stemmy" and often the tallest in the *V. purpurea* complex; it also has the longest peduncles of the group. It occurs in California from Long Valley, Mono County, and the Coso Mountains of Inyo County, to Mount Pinos and Frazier Mountain and the San Gabriel, San Antonio, San Bernardino, and Cuyamaca mountains. There are two outlying stations: Santa Rita Peak of the San Carlos Range, San Benito County, and Chews Ridge, Monterey County (one collection). In nine collections where the elevations are known, the average elevation is 6300 feet.

Type. Horsethief Canyon in a brushy flat, San Bernardino County, California, elevation 3280 feet, May 3, 1938, *Clokey 5833* (UC; isotypes at most of the large herbaria of the United States; topotype: *Anderson* and *Clokey 6753).*

There are two rather distinct forms of this subspecies, the type representing the more common form. In Mono and Inyo counties is found a form much greener in aspect *(Baker 9090),* lacking the microscopic puberulence (UC and Baker Herb.).

Viola aurea subsp. **arizonensis** subsp. nov. Baker and Clausen. Illustration, see Madroño 10: pl. 5, p. 115, 1949.

A subsp. *aurea* planta tota propter pilos brevissimos ut apud subspeciem *mohavensem* omnino sed minus canescente foliis superioribus plus minusve integris discedit et foliorum marginibus modo subsp. *aurea mohavenseque* intermedio sinuatis.

Regenerating buds rather deep-seated; stems many but undeveloped at time of flowering, later probably conspicuous; basal as well as cauline leaves numerous, grayish-green, covered throughout with a microscopic puberulence similar to that of subsp. *mohavensis;* basal leaves large, on petioles up to 9 cm. long, ovate, somewhat truncate at base but decurrent on the petiole, the margin of earliest basal leaves sinuate as in subsp. *mohavensis,* but the teeth more irregular and shallower,

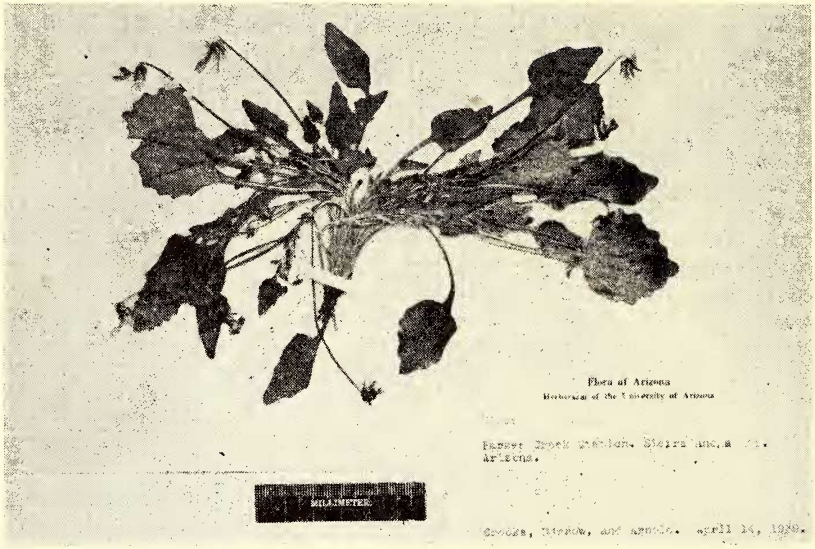

FIG. 2. *Viola aurea* subsp. *arizonensis* Baker and Clausen, photograph of lower plant on type sheet.

the apex rounded, 2.5–3.3 cm. wide, 2.8–3.5 cm. long; cauline leaves progressively smaller upwards, ovate-lanceolate, long-petioled but shorter than in the basal leaves, the margin upward gradually changing to irregularly undulate, often entire; stipules small, oblong-lanceolate, occasionally toothed, probably becoming more conspicuous in the later growth, scarcely 1 cm. long; peduncles axillary, the earliest somewhat above the leaves, bracteolate above the middle, 8–9 cm. long; sepals narrower and more acute than in the other subspecies, microscopically puberulent and more or less ciliate; corolla similar in size, form and coloring to that of subsp. *mohavensis;* pistil and stamen-sheath much as in the other subspecies; capsules and seeds unknown.

Type. Parker Creek Station, Sierra Ancha Mountains, Gila County, Arizona, April 14, 1939, *Crooks, Darrow* and *Arnold* (UA).

This subspecies is close to subsp. *mohavensis* in the size and outline of the earliest leaves and the size of the flowers. In addition, the pubescence of the young leaves is similar to that of subsp. *mohavensis,* but the old leaves become glabrate.

Subspecies *arizonensis* also differs from subsp. *mohavensis* in the much shorter peduncles, reduced caulescence, and in the narrower and longer sepals as well as in the changed margin of the cauline leaves, where the dentation is much reduced, many of the leaves being entire or nearly so, with none of the band-saw effect which invariably characterizes subsp. *mohavensis.*

The description of this subspecies is scanty owing to a lack of material, there being but two known collections. The only collection besides that of the type was made by Mrs. Rose Collum (Mazatzal Mountains, Gila County, Arizona, April 8, 1933 at 6000 feet elevation, US, NY).

Viola californica

Viola californica sp. nov. Gregi erecto-nudicaulibus affinis ex rhizomate tenui elongatoque omnino sparce puberulenta caulibus petiolis ac pedunculis hirsutis foliis tenuibus utrinsecus plus minusve ejusdem coloris profunde crenato-serratis numquam crasse irregulariterque dentatis eis superioribus saepe profunde cordatis elongatis apice lanceolatis sed apicem versus ut apud *V. lobatam* var. *integrifoliam* haud angustatis corolla lutea magna petalis superioribus parte posteriore tantum leviter fuscatis sepalis ciliatis insigniter longis angustique stylo basi subito sursum flexo.

Rootstock long and slender, stems 1 to 4, erect, 5-20 cm. high, naked below except for a scarious bract towards the base; herbage sparingly puberulent, basal leaves 1 or 2, but occasionally 3 or 4, cauline leaves 2 to 5 near the summit of stem; rootstock erect or ascending, usually long and slender, functional roots mainly adventitious, the taproot of the seedling disappearing early; leaves thin, about the same shade of green on both surfaces, margin crenate-serrate, on plainly hirsutulous petioles; basal leaves ovate-cordate, with deep sulcus and a short acuminate tip, width and length (3–6 cm.) approximately equal, on petioles 6–14 cm. long; lower cauline leaves as large as basal leaves but more elongated with little if any narrowing at base of the enlarged acuminate tip; the base of the cauline leaves may be as deeply cordate as the basal leaves or subcordate, but rarely, if ever, truncate; stipules narrowly lanceolate, scarcely foliaceous, entire, less than 1 cm. in length; stems stout, clearly hirsutulous above; peduncles with the same pubescence as the stems, 3–10 cm. long, equalling leaves; bracteoles inconspicuous, borne near the middle of peduncle; flowers few but large, the diameter in fresh specimens up to 2.6 cm.; petals broad, yellow, the upper faintly purple-backed, the lateral scantily clavate-bearded; sepals ciliate, gland-tipped, long and narrow, the lowermost narrowly linear-lanceolate, scarcely 2 mm. wide at base, 10 mm. long, the upper ones hardly enlarged at base, up to 13 mm. long; style, as in *Viola glabella,* with a sharp upward flexure at the ovary and a barely discernible stigmatic tube surrounding the foramen (fresh flowers); capsule elliptical, glabrous, beaked, similar to that of *V. glabella* but somewhat larger; mature seeds unknown.

Type. Coniferous forest, mainly *Abies concolor,* South Fork Mountain, Humboldt County, California, 5000 feet, June 14, 1946, *Baker 11492* (UC 707010); isotypes: DS, POM, MO, US, GH, NY, F, CAS, WTU, PH, WILLU, OSC.

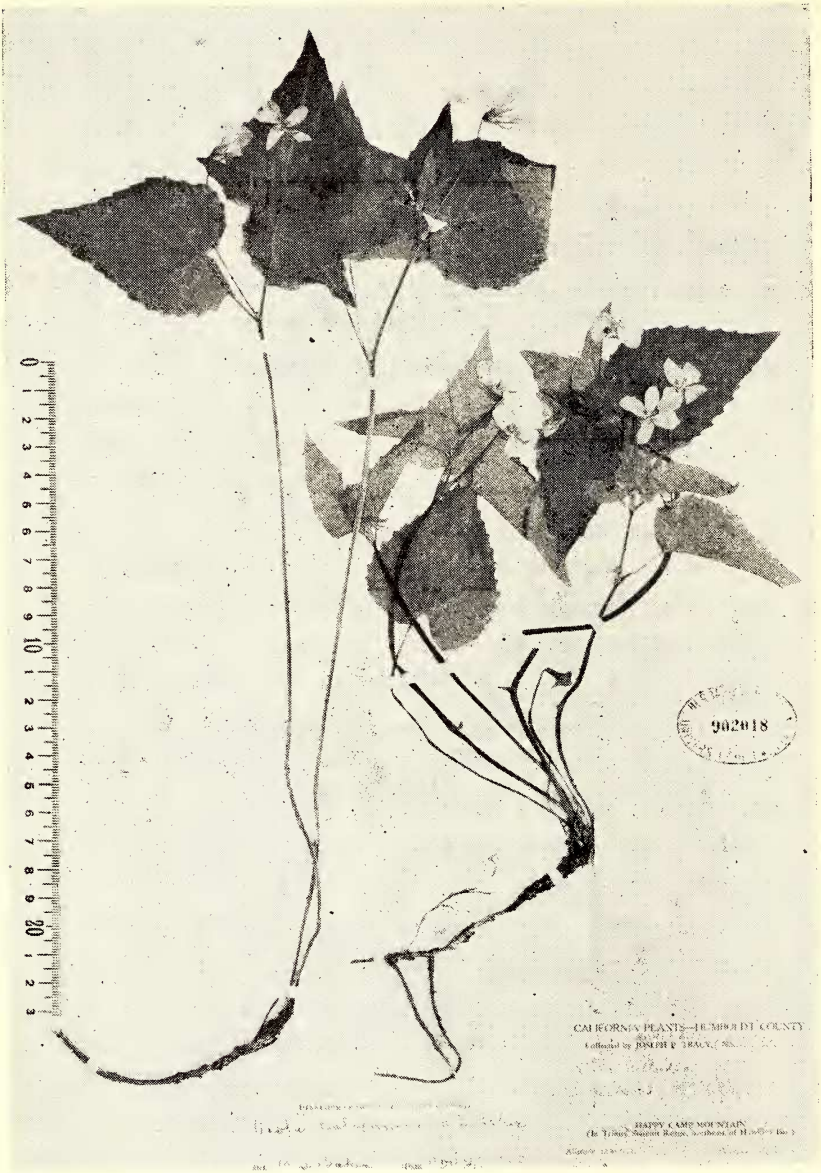

FIG. 3. *Viola californica* Baker.

The only collections known to me of *Viola californica,* aside from the type, are as follows: CALIFORNIA. Humboldt County: South Fork Mountain, 1926, *Baker 89* (UC); Grouse

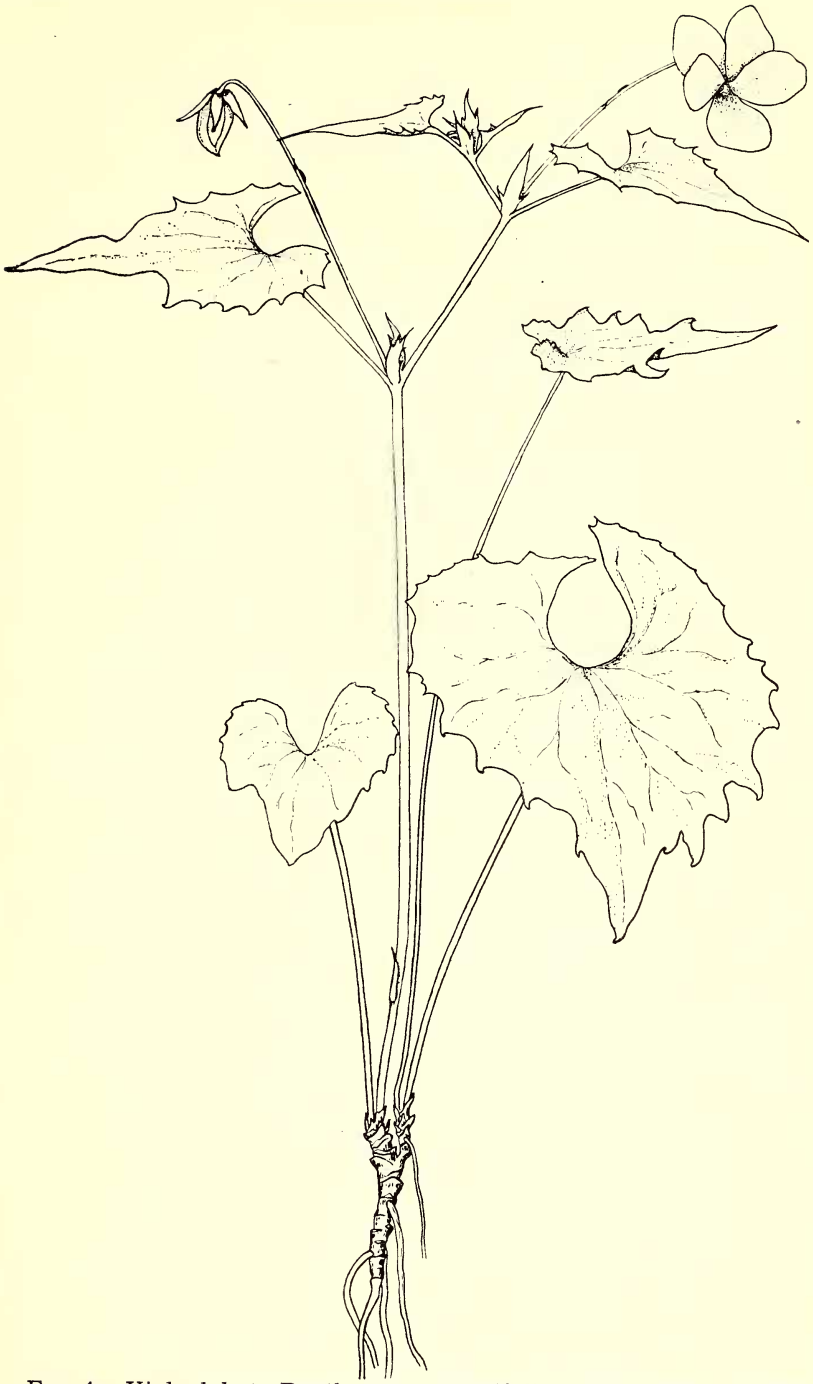

FIG. 4. *Viola lobata* Benth. var. *integrifolia* Wats. From a plant growing near Ingot, Shasta County, California.

Mountain, *J. P. Tracy 12907, 14068, 15912½, 15917* (UC); near Box Camp, 5000 feet, *Baker 11900, 11905* (Baker Herbarium). Trinity County: Happy Camp Mountain, Trinity Summit Range northeast of Hawkins Bar, 4200 feet, *Tracy 11655* (UC).

This is a rarely collected species. It first came to my attention late in July of 1926 when I discovered it in the coniferous forest of South Fork Mountain. Unquestionably it seemed to belong with the *Erectae Nudicaules* group (Section Chamaemelanium), represented on the Pacific Coast by *Viola glabella* Nutt. and *V. lobata* var. *integrifolia* Wats. Being entirely out of flower, it seemed at the time of discovery nearer to the former because of its foliage. However, the hirsutulous petioles, stems and peduncles, and elongated upper leaves left doubt as to the identity of this violet. So it remained an enigma until I learned that Mr. Joseph Tracy of Eureka, California, had been collecting the same strange violet not only on South Fork Mountain, but also at several other places in Humboldt County, all having an elevation of 5000 feet or higher.

In June, 1946, I again collected this violet on South Fork Mountain, this time in good flower. Although intermediate between *V. glabella* and *V. lobata* var. *integrifolia* Watson, it possesses some characters which are not found in either of those taxa.

From *V. glabella* it differs in having larger flowers, plainly hirsutulous stems, peduncles and petioles, in its ciliate and more slender sepals, and in its elongated upper leaves. Its habitat too is distinctive, for it grows on dry, rocky, upland soil. The rootstocks are usually more slender and much longer than in *V. glabella.*

From *V. lobata* var. *integrifolia* it differs in the abundant, much thinner leaves which are concolorous above and below, and which are regularly crenate-serrate rather than irregularly dentate, in the lower cauline leaves which are often as large and as deeply cordate as the radical leaves and in the uppermost cauline leaves which are rarely or never truncate, and not narrowed above the middle as is common in *V. lobata* var. *integrifolia,* in the upper petals which are only slightly darkened on the backs, and in the style which differs in having a sharp upward flexure near the ovary.

In conclusion, because of the large corolla, the narrow and elongated sepals, and the clearly pubescent stems, petioles and peduncles, *V. californica* should never be confused with either *V. glabella* or *V. lobata* var. *integrifolia.*

Owing to the fact that *V. lobata* var. *integrifolia* exhibits considerable variation throughout its range from southern Oregon to the southern border of California, it should be made clear that in the foregoing comparison I have in mind those plants of var. *integrifolia* growing in the region of Humboldt County, in proximity with *V. californica.*

Viola californica may have arisen as a hybrid between *V. glabella* and *V. lobata* var. *integrifolia*. It is very abundant in the forest of South Fork Mountain at 5000 feet. Mr. Tracy and I collected this violet for several miles along the forest road on this mountain but could not locate any plants below the lower altitudinal limit of the white fir. Likewise, in northern Humboldt County, Mr. Tracy has found it growing only in fir forests.

In 1949, I expressed the opinion (Leafl. West. Bot. 5:176) that the species under consideration here is *V. deltoidea* Greene. I have recently re-examined my collection of the latter species from the type locality at Waldo, Oregon, and have now come to the conclusion, that Greene's *V. deltoidea* is only a form of *V. lobata* var. *integrifolia* Wats.

Viola pallens and Viola Macloskeyi

In the West we have two white-flowered violets which are difficult to distinguish. The type locality of one, *V. Macloskeyi* Lloyd, is on Mount Hood in northern Oregon, the plant ranging southward through Oregon and California. The other, *V. pallens* (Banks) Brainerd, in its typical form, ranges from northeastern Washington (Diamond Lake, Pend Oreille County, 9 May 1923, *Spiegelhaus,* UC), north into British Columbia, east through Canada to the region of the Great Lakes and on to the higher mountains of the Atlantic States and north into Labrador and Greenland. (Reported collections of *V. pallens* from Colorado, Montana, Wyoming, Utah and Idaho have proved to be either *V. palustris* L., or *V. palustris* subsp. *brevipes* Baker.)

Between the main ranges of these two white-flowered violets, however, is an area where the distinguishing characters appear to intergrade. The following collections do not fall readily into either group. Washington: swamp near Tacoma, *Flett 108, 2222* (WS); cold bog near Olympia, Henderson *2054* (WS); British Columbia: Stanley Park near Vancouver, April and October 1913, *Henry* (Baker Herbarium); near summit of Mount Arrowsmith, *Baker 850* (Baker Herbarium). Oregon: Crater Lake, *Baker 604,* nearer to *V. Macloskeyi* except for leaf margins (Baker Herbarium); near Tumulo Ranger Station, Crook County, altitude 6000 to 7000 feet, *Ferris* and *Duthie 463* (DS), lateral petals with little or no bearding, otherwise like *V. Macloskeyi.*

Inasmuch as these taxa both have twelve pairs of chromosomes and as they appear to intergrade along their common borders, it seems reasonable to regard these two white-flowered violets as belonging to a single species. The appropriate new combinations are herewith proposed.

Viola pallens (Banks ex DC.) Brainerd subsp. **pallens.** *V. rotundifolia* var. *pallens* Banks ex. DC. Prodr. 1:295, 1824. *V. pallens* Brainerd, Rhodora 7:247. 1905.

This subspecies includes the northern and eastern material.

Viola pallens (Banks ex DC.) Brainerd subsp. **Macloskeyi** (Lloyd) comb. nov. *V. Macloskeyi* Lloyd, Erythea 3:74. 1895. *V. blanda* var. *Macloskeyi* Jepson, Man. Fl. Pl. Calif. 648. 1925.

This subspecies includes all material known at this time from Oregon and California.

Viola Beckwithii

Viola Beckwithii T. & G. subsp. **glabrata** subsp. nov. A subsp. Beckwithio foliis glabris vel glabratis segmentibus foliorum latioribus differt.

Root, rootstock, stems, foliage and flowers as in *V. Beckwithii* subsp. *Beckwithii,* except foliage glabrous or with only a trace of puberulence and leaf segments wider; habitat as far as known, open grassy spots in coniferous forests.

Type. Open grassy spots in coniferous forest along Highway 89, about 5 miles south of junction with Highway 36, altitude 4700 feet, Plumas County, California, *Baker 12435* (UC 954252).

Other collections. California. Lassen County: *H. K. Myers* in 1930 (UC, Baker Herbarium); Fredonyer Pass, altitude 5750 feet, *H. C. Cantelow 4537* (CAS), *Baker 12423* (Baker Herbarium). Nevada County: southeast end of Boca Dam, *Cantelow 4551* (CAS). Sierra County: Sardine Lake, *Sonne* in 1887 (JEPS).

The following characters of the Myers collection originally influenced me in placing the plant with *Viola Hallii:* the glabrous or glabrate foliage; the cream-color of the three lower petals; the width of the leaf-segments which are as coarse or coarser than those of *V. Hallii.*

Recent field work in Mount Lassen National Park and vicinity, Lassen County, has shown that petal-color varies from medium lavender to cream *(Baker 12435),* a color-range also occasionally exhibited in typical *V. Beckwithii.* Leaf-puberulence is also slightly variable, but the leaves are never abundantly puberulent as in *V. Beckwithii.*

This Lassen County material further resembles *V. Beckwithii* in its upper petals which are parallel with each other and at right angles to the plane of the lower petal rather than being approximately in the same plane as the lower petal, as is the case in *V. Hallii.* In the reduced aerial caulescence concomitant with the more deeply seated rootstock, these plants resemble *V. Beckwithii* rather than *V. Hallii.* The latter has a shallowly buried rootstock with a resultantly larger proportion of stem above ground.

Viola Beckwithii subsp. *glabrata* occurs at somewhat higher elevations than the typical form and in several cases at least, in open spots in coniferous forests.

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